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to stop. But since, in fact, it keeps on, there must be a cause for this mysterious behavior. The cause the author thus describes: "Little as is known of the action of air and the ethereal substance, . . . and novel as is the thought of them as continuers of motion, no violence is done to the current understanding of their nature by imagining them as in the act of urging forward an object enveloped in them. The object cannot be made to move without causing much that is before it to move in the same direction, and much also to be dissipated laterally. Thus by opening a path is resistance lessened. . . . Now consider what must simultaneously take place in the rear. A space must be vacated by the object, and as quickly filled up by an in-rushing from all directions except that of the object. To the confluence of forces so formed, there is no outlet except in the direction of the object: consequently this direction they take, impelling the object forward" (pp. 59, 60). Thus it is that the ball moves: the air pushes it. It follows, of course, that no body would follow the first law of motion in a vacuum, and that air not only resists a body's motion, but also helps it to move; and so, in company with the various 'less stable substances' that exist in space, and of which, as we learn, 'there must be many besides heat and light,' the air or some other gas forms the necessary condition for the continuance of any motion. Much more talk of a similar sort follows, about inertia and gravity and like traditional conceptions, for which our author has new explanations, quite as clear and satisfactory as the foregoing.

Now, such passages illustrate the truth that the possibility of Keeley-motor investors also illustrates, a truth painful but indubitable; viz., that high intelligence, coupled with considerable learning, does as yet, in our enlightened land, neither prevent a man from having the wildest notions about the simplest matters of elementary physical science, nor enable him prudently to conceal his ignorance. There are shrewd and educated men to be found, who will invest money in impossible motors; and there are ingenious and not unlearned men to be found, who, like our author, will talk in such confused and ignorant fashion about the simplest matters of science, which ought to have been made clear to them in their school-boy days: yet about other matters they do speak like men of sense. Their defect is not lack of mental power, but simply gross ignorance. Such speech at this time of day is disheartening. But possibly students of science, and more especially teachers of science, may

do well to consider occasionally, in view of such ingenious rubbish as this, what a work they have yet to do, before the public mind is so well trained in elementary conceptions that nonsense like the foregoing shall be not merely nonsense, but impossible to men of our author's intelligence. Good elementary instruction in physical science is certainly very much needed; and here is an illustration of the need, — an extraordinary mind, condemned to seemingly hopeless error on important questions of the most elementary sort, all for the lack of a few hours of sensible teaching in boyhood or since. Meanwhile let the case serve as a warning to those who imagine that our American public is to receive useful instruction in elementary physical science from the now popular works of the great teacher of the evolution-philosophy. Here is a very good student indeed, diligent, logical, and ingenious. What philosopher could hope for a better? He has carefully studied Mr. Spencer's works, and this is what he has got out of them. If, he tells us, an object were pushed into an absolute vacuum with any velocity whatever, we are obliged by the necessities of our thought to suppose that this object "would therefore be stopped by the withdrawal of external influence." Such, Mr. Spencer may notice, is the effect of a use of the 'universal postulate' by a very devout student, who seems to accept so much of the Spencerian system without reserve. The effect of further doses of the 'universal postulate' upon our popular thought in America can only be conjectured. Deliver us from it, merciful powers!

It is only just to add, that Mr. Lacy, while rejecting the doctrine of the unknowable, is not opposed to the philosophic foundation of the positive Spencerian doctrines viewed generally, and finds his objections "not incompatible with estimation of the 'Synthetic philosophy' as perhaps the noblest speculative product of a single mind." We cannot do better than to leave the product and the worshipper in this happy attitude towards each other.

#### GEOLOGICAL SURVEY OF ALABAMA.

*Geological survey of Alabama. Report for the years 1881 and 1882, embracing an account of the agricultural features of the state.* By EUGENE ALLEN SMITH, Ph.D., state geologist. Montgomery, W. D. Brown & Co., pr., 1883. 615 p. 8°.

THE law organizing the geological survey of Alabama requires from the state geologist, among other things, a report upon the agricultural resources of the state; and the present

volume has been prepared in obedience to this requirement: it is, in part, based on work undertaken by Dr. Smith in 1880, in the preparation of reports on cotton-culture in Alabama and Florida for the tenth census of the United States. The maps and woodcuts engraved for the census-office, and the statistics collected by the enumerators, were placed at his disposal for this report; while the geological material collected by the state survey during previous years was freely contributed to the census report on Alabama. Subsequently additional work has been done by the state survey for this report; and the resulting volume is most creditable, both to the ability of Dr. Smith, and the wisdom of the state in instituting such a survey.

Part i. of the report is introductory in its character, and consists of a general discussion of the composition, mode of formation, and properties of soils, and of the changes produced by cultivation. This discussion, extending over one hundred and fifty-three pages, is admirable of its kind. It does not attempt to present any original observations; but it is a very full and judicious *résumé* of the present state of knowledge on these topics, and shows a much greater familiarity with them than is usually expected from the geologist.

Part ii., which constitutes the report proper, is an account of the main agricultural features of the state of Alabama. Following the tabulated results of the census enumeration, — viz., table i., area, population, tilled lands, and cotton-production; and table ii., acreage and production of leading crops, — we find section i. devoted to an outline of the physical geography and geology of the state, and an enumeration of its agricultural subdivisions; section ii. giving a detailed description of these agricultural subdivisions; section iii., agricultural descriptions of the counties of Alabama; and section iv., cultural and economic details of cotton-production.

For the purposes of agricultural description, Dr. Smith divides the state into three divisions, — a middle, a northern, and a southern. Of these, the middle division is the oldest geologically, and consists of the south-western termination of the Appalachian chain; and the northern is the next in order, consisting of the southern termination of the great Cumberland tableland and of the highlands of Tennessee, together with the Warrior coal-basin. With the exception of bottom and alluvial lands, the soils of this division are sedentary soils, resting upon the rocks from which they were formed; and both the agricultural and topo-

graphical features of the country are largely determined by its geological structure.

In the southern division, on the contrary, these features are largely independent of geological structure, and “almost exclusively the result of erosion as determined by differences in the material of a single formation, — the stratified drift or Orange sand, which, except in parts of the prairie belt, covers the underlying beds over this whole division.”

The soils of each of these regions are very fully described, the description being in many cases accompanied by chemical analyses and determinations of the more important physical properties. In the middle and northern divisions the classification is chiefly geological, while in the southern it is based mainly on the character of the prevailing forest-growth. A valuable addition to this portion of the report is a list of trees and lesser plants characteristic of the several regions of the state, prepared by Dr. Charles Mohr of Mobile.

The report is illustrated by three geological sections, an agricultural map of the state, and maps showing the distribution of temperature and rainfall for the year, and also for the winter and summer seasons.

#### LATE ELECTRICAL BOOKS.

*Absolute measurements in electricity and magnetism.* By ANDREW GRAY. London, Macmillan, 1884. 16+207 p., illustr. 24°.

*Notes on electricity and magnetism.* By J. B. MURDOCK. New York, Macmillan, 1884. 8+139 p., illustr. 16°.

MR. GRAY'S book on absolute measurements is the outcome of a series of articles from his pen, upon the measurement of currents and potentials, published in *Nature* in 1882 and 1883: it is, in fact, a reprint of these articles, with some alterations and considerable and important additions; and it must be regarded as a most useful contribution to what may be called the *available* literature upon this subject.

The presentation of the systems of computation, based on the so-called absolute units, is clear and accurate, and will enable the student to obtain a firmer grasp upon the methods now all but universally used than can easily be secured from other sources.

The work opens with a description and discussion of methods of determining the horizontal component of the earth's magnetism, upon which so many electrical measurements are made to depend. Mr Gray is a warm advocate of the use of small masses in this operation, suggesting the use of magnets of